ON THE CYTOMORPHOLOGY OF THE NEUROSECRETORY SYSTEM OF TERRESTRIAL ISOPODS

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Tough the present trend of research is concentrated on the function, one may always come across some new structural data in the course of experiments. As early as 1959 Matsumoto described in detail the different kinds of neurosecretory cells occuring in the central nervous system of Armadillidium vulgare. The neurosecretory cells of Porcellio scaber were described by Messner (1966) and those of Procellio dilatatus by Besse and Legrand (1964). Gabe (1952) has described a cell group named X-organ in the optic lobe of different Oniscoida species. In the course of our experiments some observations were made which supplement and/or modify in some aspects the former descriptions and data.

Materials and methods

In the present work speciment of different age and sex belonging to some terrestrial isopod species (such as *Porcellio dilatatus* Brandt, *Porcellio laevis* Latreille, *Protracheoniscus asiaticus* Uljanin) were investigated. The animals were fixed in Bouin or Susa solution, and embedded according to Péterfi. The 5—8 μ thick sections were stained with Gomori' and Gabe's paraldehyde-fuchsin, with Gomori's chromhaematoxylin-phloxine, by means of Halmi's neurosecretory staining technique, respectively. Some of them were stained using Heidenhain's azan method or Sterba's pseudoisocyanine method.

Results

First our interest was focused on the protocerebrum and on the attached optic lobe. In this area all four kinds of neurosecretory cells, i.e. A-, B-, β-, and γ-cells occur. The shape, size, and staining of these cells are similar to those reported by Messner (1966). The axons of the B-cells occuring in great number penetrate deeply into the neuropile where — particularly in summer — they are fairly perceptible in the course of an intensive neurosecretory process

(Figs. 1 and 2). The axons of β-cells can be followed very well and they reach undoubtedly as far as the sinus gland (Fig. 3).

The plasma of γ-cells in the optic lobe is intensively stained by paraldehyde-fuchsin. These cells occur in groups and their axons go towards the sinus gland (Fig. 4). Experimental intervention (e.g. illumination) causes an increased secretion in these cells (Fig. 5). The track of the axons carrying the secretion material can be well followed over the lamina ganglionaris towards the sinus gland. In addition to the above mentioned four well-known cell types, a further type has been found which can be observed in the brain ganglion of both *Asellus aquaticus* and *Armadillidium vulgare* as well as in that of *Porcellio species*. These cells are situated at the frontal part of the protocerebrum, on the right – and leftside of the medial "aorta", i.e. one pair on the dorsal and one pair on the ventral side.

The cells are remarkably large (30 μ), exhibit elongated shape and excentrically situated nuclei. A vacoule of irregular shape as long as 15 μ containing phloxinophilic colloid mass is characteristic for this type of cells. The plasm often contains Gomori-positive granules, too. The axon of the cell can hardly be followed.

Discussion

The structure of the X-organ of decapods and its correlation with the sinus gland is more or less clear (Fig. 7). G a b e (1952) believed to have found a similar X-organ in the isopods too. M e s s n e r (1966), however, has suggested that this X-organ is absent in isopods, and solely the β-cells of the protocerebrum are in close relation with the storage organ. As the axons of γ-cells could have been followed as far as the area beyond the lamina ganglionaris, it can be assumed that they get through to the sinus gland (Fig. 8). Further investigations may elucidate the still open questions.

If the secretion product of γ-cells gets actually in the sinus gland, this cell group can be considered as an X-organ, though its structure is much more simple than that of more developed decapods. The neurosecretory system of isopods represents a transition from neurosecretory system of the *Entomostraca* – to that of the *Malacostraca* groups.

In spite of the fact that we have demonstrated its presence in several species, the literature still seems to ignore phloxinophilic cells as reviewed in this paper. W e y g o l d t (1961), however, has mentioned the presence of a similar cell in *Cypris pubera* but failed to give a detailed description.

Summary

Our results on the cytomorphology of the neurosecretory system of isopods can be summarized or follows:

1. The γ-cells form in the area of the optic lobe a cell group which is similar to the X-organ of decapods.
2. The axons of γ-cells go towards the sinus gland and, in addition to the β-cells of the protocerebrum, they are part of the sinus gland.

3. On the frontal part of the protocerebrum a new celltype has been described, one pair of these cells is situated on the dorsal and the other pair on the ventral side of the medial aorta. A giant vacuole of phloxinophilic colloid content is characteristic of these cells.

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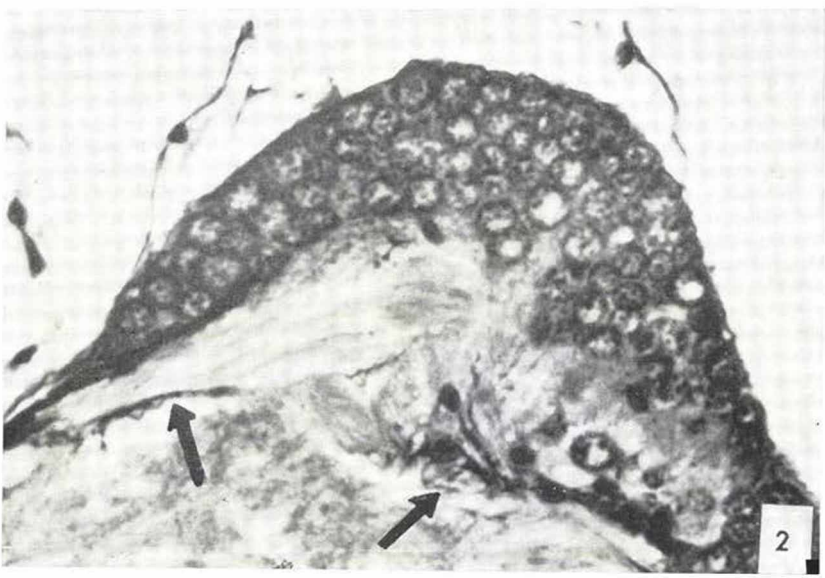
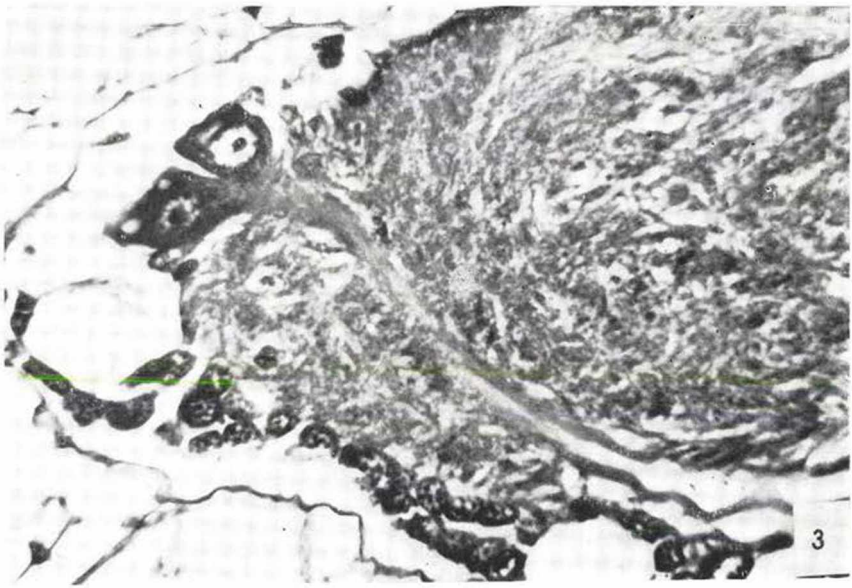


Fig. 1. B-cells in the protocerebrum. Bouin. Paraldehyde-fuchsin. Opton Photomicroscope oc. 8, obj. 40

Fig. 2. Secretion carrier axons of B-cells in the neuropile. Bouin. Paraldehyde-fuchsin-haematoxylin. Opton Photomicroscope oc. 8, obj. 40



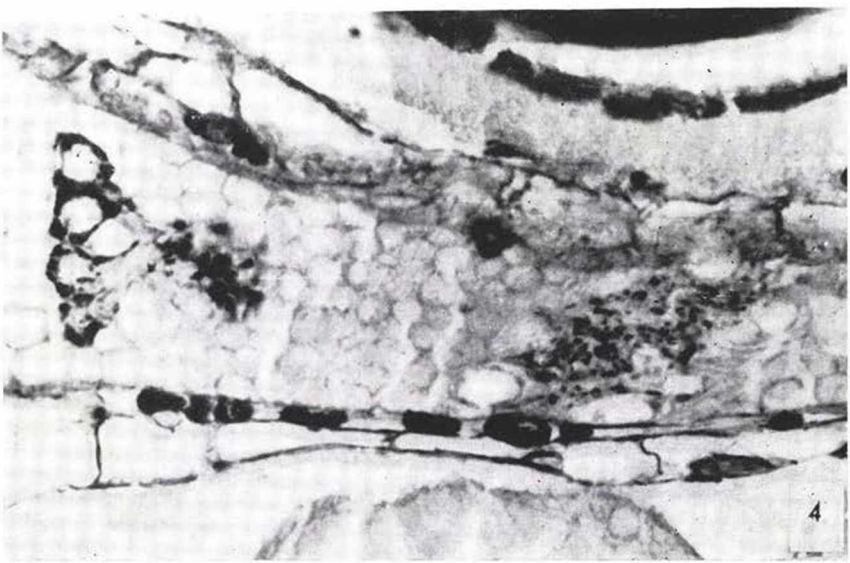
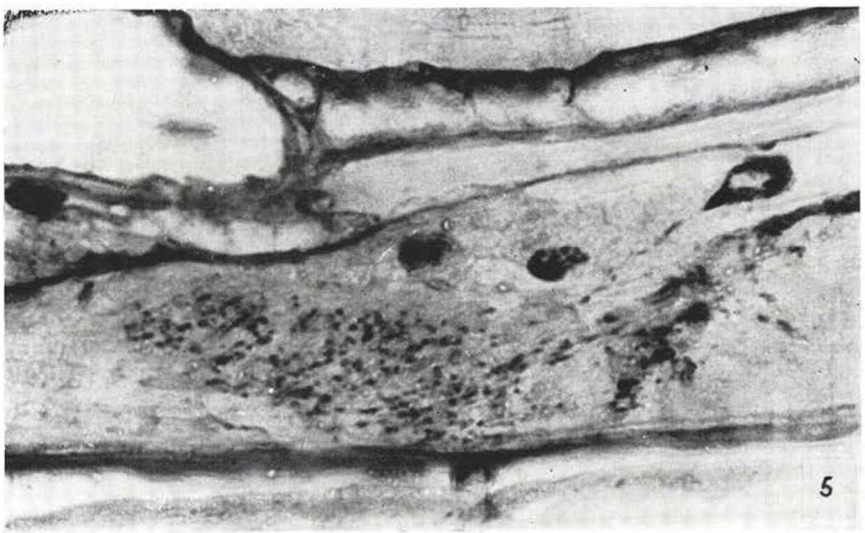


Fig. 3. β-cells with giant axons. Bouin. Paraldehyde-fuchsin-haematoxylin. Opton Photomicroscop oc. 8, obj. 40

Fig. 4. A group of γ-cells in the optic lobe. Bouin. Paraldehyde-fuchsin. Opton Photomicroscope ac. 8, obj. 40



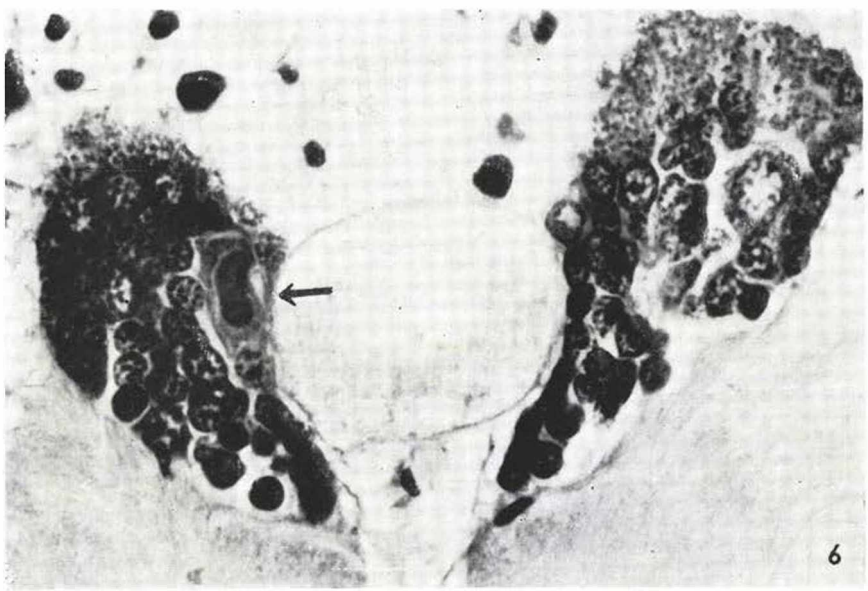


Fig. 5. γ-cell with axon in the optic lobe. Bouin. Paraldehyde-fuchsin. Opton Photomicroscope oc. 8, obj. 40.

Fig. 6. Phloxinophilic cell. Bouin. Chromhaematoxylin-phloxin. Opton Photomicroscope oc 8, obj. 40

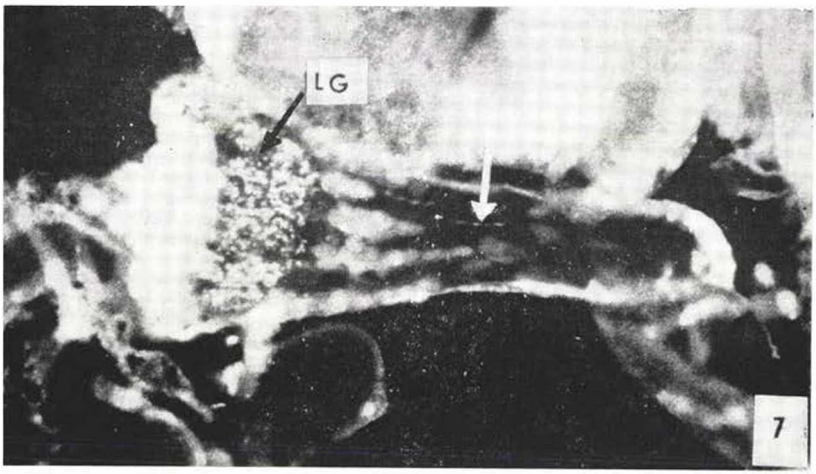


Fig. 7. Axons of γ-cells in the optic lobe. Bouin. Pseudo-isocyanine

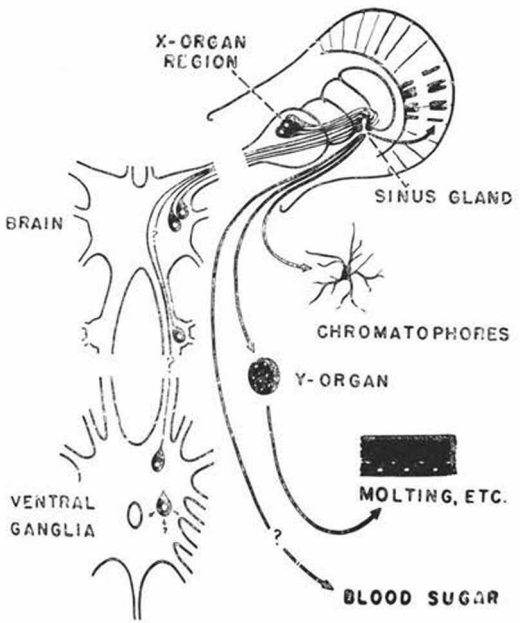


Fig. 8. A diagram of the neurosecretory system of Brachyura (after Welsh)